





The discovery of **NEPTUNE** is an excellent example of the application of the scientific method on an international scale. Astronomers discovered Neptune as a result of their efforts to understand the orbit of Uranus. Observations of Uranus' orbit did not agree with theory, which led theorists to hypothesize about the existence of yet another planet, well beyond Uranus which perturbed the orbit of Uranus. Calculations were performed to reveal the approximate location followed by investigators at institutions in several countries confirmed the existence of the hypothesized planet—Neptune.

When *Voyager 2* flew within 5,000 km of Neptune on August 25, 1989, the planet was the most distant member of the solar system from the Sun. (In 1999, Pluto will once again become the most distant planet.) Neptune orbits the Sun every 165 years, and is the smallest of the solar system's gas giants. *Voyager 2* solved many of the questions scientists had about Neptune's rings. Searches for "ring arcs," or partial rings, showed that Neptune's rings actually are complete, but the thickness of the rings vary so that they cannot be fully viewed from Earth.

Even though Neptune receives only three percent as much sunlight as Jupiter does, it is a dynamic planet and surprisingly showed several large, dark spots reminiscent of Jupiter's hurricane-like storms. The largest spot, dubbed the Great Dark Spot, is about the size of Earth and is similar to the Great Red Spot on Jupiter. At low northern latitudes, *Voyager 2* captured images of cloud streaks casting their shadows on cloud decks below. The strongest winds on any planet were measured on Neptune. Most of the winds blow westward, opposite to the rotation of the planet. Near the Great Dark Spot, winds blow up to 2,000 km/hr. A small irregularly shaped, eastward-moving cloud was observed "scooting" around Neptune every 16 hours or so, which could be a cloud plume rising above a deeper cloud deck.

The magnetic field of Neptune, like that of Uranus, is highly tilted—47° from the axis of rotation. The magnetic fields of the two planets are similar. Scientists think the extreme orientation may be characteristic of flow in the interiors of both Uranus and Neptune. Studies of radio waves caused by Neptune's magnetic field revealed

the length of a Neptunian day to be approximately 16 hours. Auroras were detected but are much weaker than those on Earth and other planets.

Neptune is now known to have eight satellites, six of which were found by *Voyager 2*. The new satellites are all small and remain close to Neptune's equatorial plane. Names selected from mythology's water deities have been given to Neptune's newest satellites by the International Astronomical Union.

Triton, the largest satellite of Neptune, has proved to be not only the most intriguing satellite of the Neptunian system, but also one of the most interesting in all the solar system. It shows evidence of a remarkable geological history, with active geyser-like eruptions spewing invisible nitrogen gas and dark dust particles several kilometers into the tenuous atmosphere. Triton's relatively high density and retrograde orbit offer strong evidence that Triton is not an original member of Neptune's family but is a captured object. If that is the case, tidal heating could have melted Triton in its originally eccentric orbit, and the satellite might even have been liquid for as long as one billion years after its capture by Neptune.

Fast Facts

Namesake	Roman god of the Sea
Distance from Sun	4,501.2 Million Kilometers
Period of Revolution	164.79 Years (One Neptune Year)
Equatorial Diameter	49,528 kilometers
Atmosphere	Hydrogen and Helium (Main Components)
Moons (8) In increasing distance from Planet	Naiad, Thalassa, Depoina, Galatea, Larissa, Proteus, Triton, Nereid
Rings	Four thin rings of varying thickness
Inclination of Orbit to Ecliptic	1.77°
Eccentricity of Orbit	0.009
Rotational Period	16.11 hours
Inclination of Axis	28.8°

Significant Dates

- 1845— Mathematicians John Adams (British) and Jean Leverrier (French) predict Neptune based on orbital motion of Uranus.
- 1846— German astronomer Johann Galle discovered Neptune using predicted location provided by Adams and Leverrier.
- 1846— British astronomer William Lassell discovers Neptune's largest satellite, Triton.
- 1849— American astronomer Gerard Kuiper discovered Nereid.
- 1885— Rings of Neptune discovered by astronomers based on star occultations.
- 1889— *Voyager 2* discovered six small satellites: Desponia, Galatea, Larissa, Naiad, Proteus, and Thalassa.

About the Image

During 1989, the Voyager 2 narrow-angle camera was used to photograph Neptune almost continuously for two days, recording approximately two and a half rotations of the planet. This image shows two of four cloud features Voyager 2 tracked including the Great Dark Spot and a smaller dark spot. The image has been processed to enhance the visibility of features, at some sacrifice of color fidelity. The Great Dark Spot near the left side of the planet circuits Neptune every 18.3 hours. The bright clouds immediately to the south and east of this oval are seen to substantially change their appearance in periods as short as four hours. The smaller dark spot at the lower right of the planet circuits Neptune every 16.1 hours.

References

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